REMARKS

Obviousness Rejections

On page 3 of the Office Action, claims 4-9 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimomura et al. (JP-2001-157574) in view of Johnsson et al. (Biophysical Journal 2001 80:313-323), Nishikawa et al. (Materials Research Society Symposium Proceedings 2002 724:N11.7.1-N11.7.6), and Maruyama et al. (Thin Solid Films 1998 327-329:854-856). Also, on page 5 of the Office Action, claims 4 and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimomura et al. in view of Huang et al. (U.S. Patent No. 5,283,122), Nishikawa et al., and Maruyama et al.

Applicants respectfully submit that the present invention is not obvious over the cited art combinations, and request that the Examiner reconsider and withdraw these rejections in view of the following remarks.

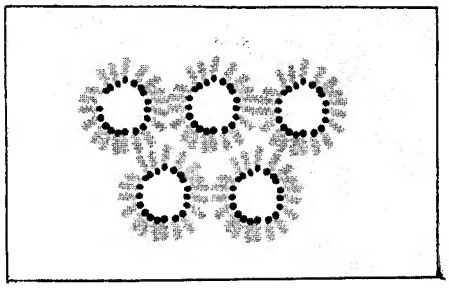
Initially, Applicants note that the Examiner maintained the position that the present invention is not patentable under 35 U.S.C. 103 (a) by providing two lines of reasoning to show that the present invention is an obvious variant over Shimomura. The key point of the two lines of reasoning lies in the fact that phospholipids form an inverted hexagonal structure in aqueous solution, citing Johnsson et al. and Huang. On that basis, according to the Examiner, the inverted hexagonal structure of the prior art can be equated to honeycomb structure of the present invention.

Applicants would like to traverse the Examiner's position by showing this is not the case, and therefore, the Examiner's logic cannot be maintained. Accordingly, Applicants present the remarks below.

A. "Inverted hexagonal phase" of the prior art

The Examiner is correct in that phosphatidylethanolamine may form an inverted hexagonal structure in aqueous solution pursuing the most stable form under a given condition. Fig 1 depicts an aqueous solution of dioleoylphosphatidylethanolamine.

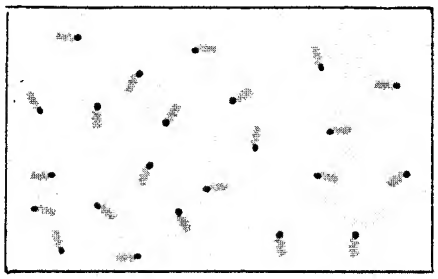
Fig. 1



This is the "inverted hexagonal phase" of phosphatidylethanolamine. The internal portion is the hydrophilic region and external portion is the hydrophobic region of a phosphatidylethanolamine molecule. Please note that the diagram only shows five cross-sections of tubular structures that penetrate the diagram. In other words, the inverted hexagonal phase of phospholipids in water is a trajectory depicted by moving the diagram to the vertical direction.

In contrast, Fig 2 shows phosphatidylethanolamine in a hydrophobic organic solvent. Since phosphatidylethanolamine can be dissolved in the solvent, the molecules are dispersed and do not form an inverted hexagonal structure.

Fig. 2



B. Honeycomb structure of the present invention

Applicants would now like to explain the mechanism of forming a honeycomb structure of the present invention in detail using Fig 3 below.

(1) A polymer and an amphiphilic molecule are dissolved in an organic solvent such as chloroform.

(2) The polymer solution is cast onto a plane surface.

(3) On the surface of the polymer solution, moisturized airflow is provided.

(4) The volatile organic solvent used evaporates gradually from the surface and the temperature of the surface decreases owing to evaporative latent heat.

(5) A portion of the moisture in the airflow condenses and forms water droplets on the chilled surface. These droplets continue to grow and sink into the polymer solution.

(6) Since the water droplets are covered with amphiphilic molecules, wherein the hydrophobic portion of the molecules are oriented outside of the droplets, the surface of the droplets is hydrophobic and this prevents fusion of the droplets and stabilizes them. The organic solvent in the polymer solution continues to evaporate.

(7) After complete evaporation of the organic solvent, water of the droplets evaporates at the end as well.

(8) A honeycomb structure of the polymer remains.

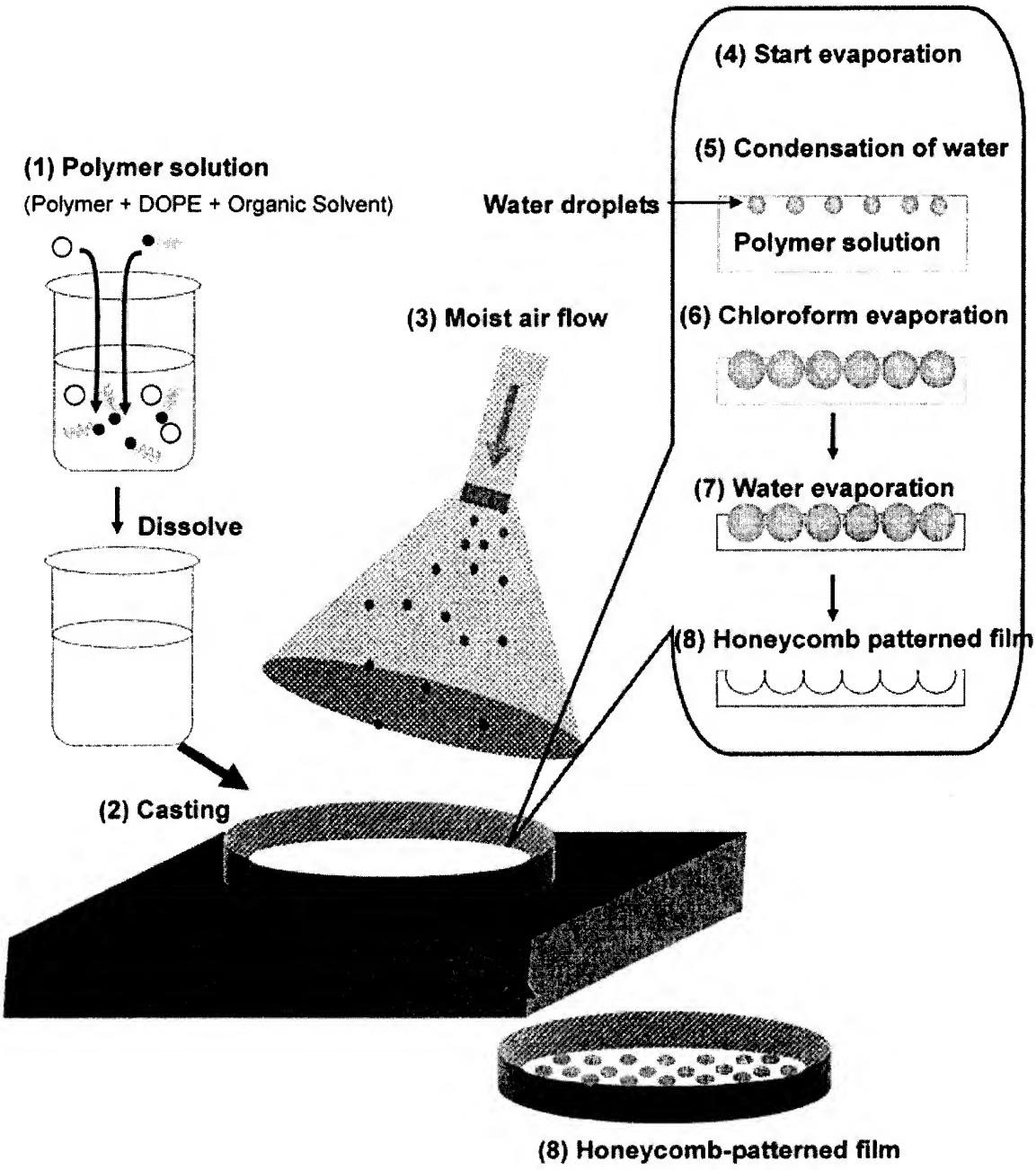


Fig 3. Schematic illustration of honeycomb-patterned film formation.

Thus, the honeycomb structure of the present invention is an imprint of uniformly packed water droplets. In contrast, the inverted hexagonal phase of the prior art is a bundle of tubular structures, though the cross-section of which gives a honeycomb-like pattern.

In addition, as a consequence of the mechanism of forming the honeycomb structure of the present invention, dissolving amphiphilic molecules in a volatile hydrophobic organic solvent together with the polymer is necessary. Therefore, even though the teaching of the prior art in aqueous solution is applied to Shimomura, an ordinary artisan could not have reached the present invention.

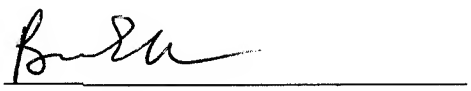
Thus, Applicants submit that the present invention is not obvious over the cited art combinations, and withdrawal of these rejections is respectfully requested.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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